

# OSTRACODA (CRUSTACEA: PODOCOPIDA) FROM SOUTHERN AUSTRALIAN SALT LAKES, WITH THE DESCRIPTION OF *RETICYPRIS* NEW GENUS

by K. G. MCKENZIE\*

## Summary

MCKENZIE, K. G. (1978) Ostracoda (Crustacea: Podocopida) from southern Australian salt lakes, with the description of *Reticypris* new genus. *Trans. R. Soc. S. Aust.* **102**(7), 175-190, 30 November, 1978.

Ostracoda are identified from collections made in South Australian and Western Australian salt lakes. The new genus, *Reticypris*, new species *Cyprinotus edwardi*, *Diacypis paracompacta*, *D. occidentalis*, *Reticypris herbsti*, *R. dedeckkeri*, *Cyprideis westraliensis*, *Microcytherura difficilis*, *Cytheroma sudaustralis* and new subspecies *Mytilocypris tasmanica chapmani* are described.

## Introduction

The continental Ostracoda of Australia are gradually becoming better known, thanks to the impetus given to taxonomic studies by limnologists. For an arid continent the study of saline lake environments has obvious relevance and, since Ostracoda are one of the commoner groups in such environments, it is regrettable that little relevant taxonomic work has been undertaken. The opportunity to improve this situation came with an invitation from W. D. Williams to study the ostracodes in saline lake collections made by him in southern South Australia and Western Australia in 1971 and 1972. The chemical composition of these environments and detailed locality maps are provided in Williams & Buckney (1976).

Previously, the large endemic species have been studied by De Deckker (1974, 1975, 1976) and McKenzie (1966), and valuable work was done by Herbst (1957, 1958) on the endemic genera *Platycypis* and *Diacypis*. In addition to species described by these workers, a new genus, eight new species and a new subspecies were identified in the course of the present study.

## Materials and methods

Soft parts have been drawn using a Wild M-20 camera lucida. External carapace mor-

phology was photographed by scanning electron microscopy but internal features have been drawn.

The German taxonomic terms Zahnborsten and Strahlen are used commonly in the general ostracode literature. Zahnborsten are spine-like bristles on the maxillule third lobe which are often barbed. Strahlen are pilose setae on the respiratory epipods of the mandible, maxillule and maxilla (P I). The terms P I, P II, P III refer to paired thoracic limbs on the rear of the body. The  $\alpha$ ,  $\beta$ , and  $\gamma$  sensory bristles on the mandible endopod were defined and illustrated in McKenzie (1977a).

The conventions: L = length; H = height; B = breadth; RV = right valve; LV = left valve; have been used throughout. The term "population" means at least a dozen individuals of a species, including adult males and females and juveniles.

Types are stored at the Australian Museum, Sydney and the remainder of the material has been returned to W. D. Williams, University of Adelaide. Copies of appendices which give locality details (Appendix I), ostracode determinations and numbers of specimens by locality (Appendix II), and associated fauna (Appendix III) may be obtained from the author.

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### Systematic descriptions

Superfamily: CYTHERACEA Baird, 1850

Family: CYTHERIDEIDAE Sars, 1925

Subfamily: CYTHERIDEINAE Sars, 1925

Genus: CYPRIDEIS Jones, 1857

#### *Cyprideis westraliensis* sp. nov.

FIGS 1-3, 21-28

*Holotype*: AM P26650, adult male.

*Paratypes*: AM P26651; 2 adult females, 1 adult male.

*Type locality*: Causeway at Lake Preston, W.A.

*Material*: Populations from Lakes Preston and Coolongup, W.A.

*Description*: Shell whitish, but appearing brownish because of yellow-brown soft body inside; medium sized; elongate subrectangular in lateral view; inequivalved with LV distinctly larger, and RV possessing small posteroventral spine in some individuals; ornamented with large shallow pittings; dorsum straight, slightly inclined posteriorly; anterior more broadly rounded than posterior; venter weakly inflexed anteriomedially; greatest height just in front of central muscle scars, and about half length. In dorsal view subelliptical; tapering anteriorly, rounded posteriorly; displaying sex dimorphism: females broadened posteriorly whereas males are not; greatest breadth medial and under half length in males, but postero-medial and about half length of females. Internally: lamellae moderately broad; narrow anterior and posterior vestibules present; inner margin regular; marginal pore canals numerous, often branched; normal pore canals scattered, sleeve type; central muscle scars comprising 4 adductors in subvertical row, a large V-shaped frontal scar, a fulcral scar and at least one large mandibular, some dorsal scars observed also; hinge entomodont, consisting in

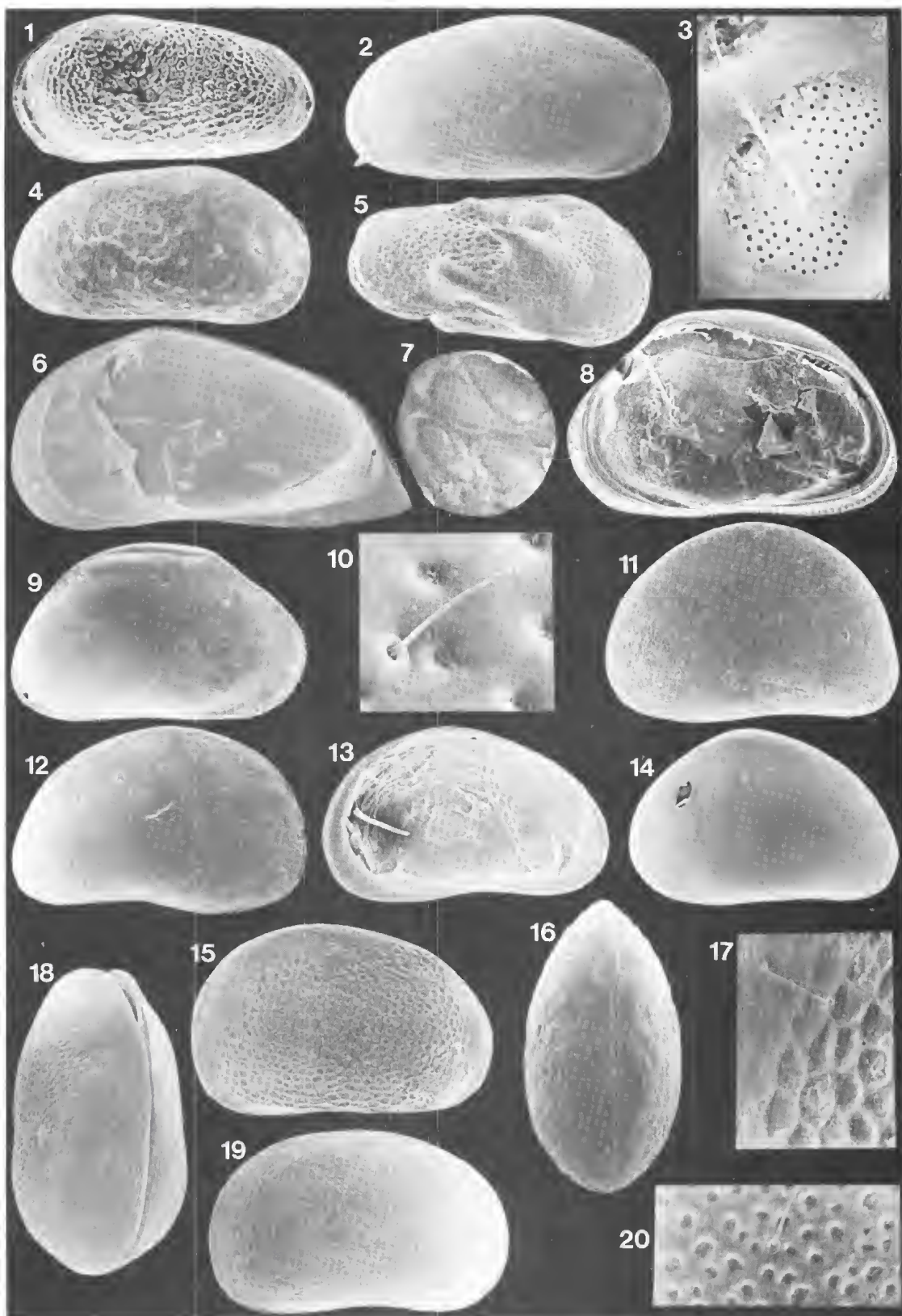
RV of elongate, distinctly crenulate terminal tooth-like projections, and medially with crenulate furrow anteriorly which becomes weakly crenulate ridge posteriorly; LV complementary.

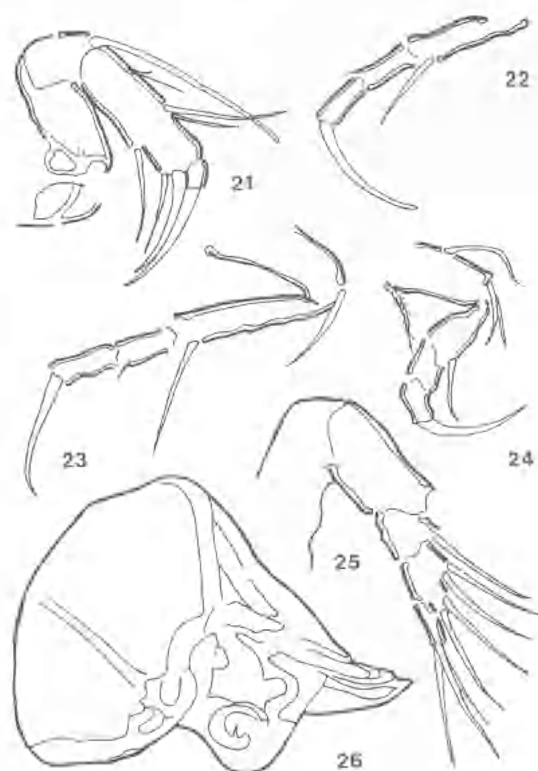
Antennule robust, 5-segmented; segmental length ratios 25:22:10:10:11; armature comprising mainly strong claw-like spines, terminal segment about 3½ times as long as wide. Antenna powerful, 4-segmented; segmental length ratios 35:7:33:5; armature normal; flagellum long, 2-segmented. Mandible coxa powerful; coxal teeth decreasing regularly in size from front to rear; endopod normal; epipod with 5 Strahlen. Maxillule palp and lobes normal; epipod with 17 Strahlen, including one which points downwards. Thoracic limbs (P I to P III) all functioning as walking legs, and displaying asymmetry between right and left limbs, especially in male P II, which is typical for this genus. Brush shaped organs present in male. Furca much reduced. Posterior of female body flattened and produced into a pointed lobe. Cups of nauplius eye fused. Hemipenes large, comprising an ovate posterior girdle strengthened by numerous muscle bands, and acuminate anterior lappet; this combination typical for genus. Natural colour of soft body yellow-brown.

*Dimensions*: Holotype, adult male—L = 0.90 mm, H = 0.44 mm, B = 0.44 mm. Paratype, adult female—L = 0.92 mm, H = 0.45 mm, B = 0.46 mm.

*Discussion*: The genus *Cyprideis* is well known, not only because it is polyhaline and regularly encountered in a variety of fresh, brackish and saline environments, but also because its distribution is cosmopolitan, extending to every continent except Antarctica. Long ago it was hypothesised that this cosmopolitan distribution was effected by birds, and some recent

Figs 1-20. Figs 1-3: *Cyprideis westraliensis* sp. nov., holotype. 1: external LV,  $\times 40$ ; 2: external RV,  $\times 45$ ; 3: sieve type normal pore canal,  $\times 1500$ . Fig. 4: ? *Microcytherura difficilis* sp. nov., holotype, external RV,  $\times 120$ . Fig. 5: *Limnocythere mowbrayensis*, female, external RV,  $\times 100$ . Fig. 6: *Mytilocypris tasmanica chapmani* sp. nov., holotype, internal RV,  $\times 15$ . Fig. 7: *Diacypris occidentalis* sp. nov., paratype AM P26674, detail muscle scars internal RV,  $\times 375$ ; Figs 8-10: *Cyprinotus edwardi* sp. nov., 8, paratype, AM P26664, internal RV,  $\times 25$ ; Fig. 9, holotype, male, external RV,  $\times 25$ ; Fig. 10, rimmed simple normal pore canal of holotype  $\times 800$ . Figs 11, 12: *Diacypris paraconpacta* sp. nov., paratype, AM P26670, female. 11: external LV,  $\times 60$ ; 12: external RV,  $\times 60$ . Figs 13-14: *Diacypris occidentalis* sp. nov., paratype, AM P26674, female. 13: internal RV,  $\times 65$ ; 14: external LV,  $\times 55$ . Fig. 15: *Reticypis herbsti* gen. nov. sp. nov., holotype, male, external LV,  $\times 60$ . Fig. 16: ? *Microcytherura difficilis* sp. nov., holotype, dorsal view  $\times 110$ . Fig. 17: *Reticypis herbsti* gen. nov. sp. nov., holotype, rimmed simple normal pore canals,  $\times 300$ . Figs 18, 19: *Reticypis dedekkeri* gen. nov. sp. nov., paratype, AM P26682, female. 18: dorsal view,  $\times 60$ ; 19: external LV,  $\times 60$ . Fig. 20: *Diacypris occidentalis* sp. nov., paratype AM P26674, female, rimmed, simple, normal pore canal,  $\times 450$ .





Figs 21-26. *Cyprideis westraliensis* sp. nov., holotype, male; 21: antenna; 22: distal P II; 23: distal P III; 24: P I; 25: antennule; 26: hemipenis. All magnifications  $\times 300$ .

experimental confirmation has been obtained (Löffler & Leibetseder 1965). Because *Cyprideis* broods its first instar in the shell, the passive transport of both sexes or of impregnated or brooding females is necessary to effect distribution across barriers such as the oceans and great deserts (McKenzie 1973).

Over 30 species of *Cyprideis* have been described but, because the carapace morphology can vary intraspecifically and is similar in practically all species, distinctions often rest on differences in the male hemipenis, which follows a pattern characteristic of the genus. However, the hemipenis of *Cyprideis westraliensis*, in particular the morphology of the internal chitinised process, is not matched in any previously described species.

*Derivation of name:* From Western Australia.

Family: CYTHEROMATIDAE Elofson, 1939

Subfamily: CYTHEROMATINAE Elofson, 1939

Genus: CYTHEROMA Müller, 1894

### *Cytheroma sudaustralis* sp. nov.

FIGS 30, 35-42

*Holotype:* AM P26652, adult male.

*Paratypes:* AM P26653-26654, 2 adult females, 1 adult male.

*Type locality:* Coastal pond between Port Clinton and Wakefield, S.A.

*Material:* Five topotypic adults

*Description:* Shell whitish; medium sized; elongate subreniform in lateral view; inequivalved, left valve (LV) slightly larger than right valve (RV) and overlapping it ventrally; shell smooth; dorsum gently convex; anterior rounded; posterior broadly rounded; venter weakly inflexed anteromedially; greatest height just behind adductor muscle scars, and about half length. In dorsal view regularly elliptical; greatest breadth medial and about half length. Internally; lamellae broad; line of concrescence marginal; anterior vestibule large, posterior vestibule large and elongate; inner margin regular; marginal pore canals short and numerous; normal pore canals large, sieve-type, numerous; central muscle scars comprising 4 adductors in subvertical series, plus broadly V-shaped frontal scar, fulcral scar, and two mandibular scars; hinge very weakly lophodont, RV with lobate anterior antislip projection and low weakly crenulated posterior projection, LV with complementary antislip projection, weakly developed median bar and shallow posterior groove.

Antennule 6-segmented; segmental length ratios 7:7:2:1.5:2.5:3; armature consisting mainly of strong claw-like spines; terminal segment about 5 times as long as wide. Antenna broad and short; segmental length ratios 9:11:4; armature normal; flagellum 2-segmented; antennal gland lobate. Mandible coxa normal, second tooth from anterior slightly more prominent than others which otherwise diminish in strength regularly from front to rear; endopod normal; epipod with 2 very long Strahlen and 1 or 2 shorter Strahlen. Maxillule palp and lobes normal; epipod with a single aberrant Strahl and 14 feathered Strahlen. Thoracic limbs normal, increasing in size from P I to P III as illustrated. Posterior of body hirsute in both sexes. Cups of the nauplius eye fused.

Carapace sex dimorphism very weak, females slightly larger and broader than males. Hemipenes large, about 40% of body length, pointed anteriorly and similar to those illus-



trated for other cytheromatids, being characterised by prominent penifera.

**Dimensions:** Holotype, adult male—L = 0.53 mm; H = 0.26 mm; B = 0.27 mm. Paratype, adult female—L = 0.56 mm; H = 0.28 mm; B = 0.29 mm.

**Discussion:** *Cytheroma* has been described rarely in the literature. Hartmann (1964) notes five species, of which *C. similis* Skogsherg, 1959 is probably a *Paracytheroma*, and Schornikov (1969) has described a sixth. Further, Species DG Maddocks, 1966 may be a *Cytheroma*. These other species all differ in shape from the new species.

The distributions of other genera in the family form an interesting biogeographic pattern. *Paracytheroma* Juday, 1907 and *Megacythere* Puri, 1960 (which some authors have synonymised) occur in the Caribbean and on both coasts of the Americas as far south as Valdivia, Chile (Hartmann 1962). *Pontocytheroma* Marinov, 1960 is restricted to the Black and Azov Seas (Schornikov 1969). The other *Cytheroma* species occur in the North Atlantic, Mediterranean and Red Sea, possibly even to Madagascar (Maddocks 1966). There are no records of these genera from the southern coasts of Africa (Hartmann 1974).

*Cytheroma sudaustralis* therefore may be considered as a palimpsest of an earlier Tethyan distribution pattern, once continuous for many groups from the Gulf of Mexico to Australasia (Ekman 1953, McKenzie 1967b).

**Derivation of name:** From South Australia.

Family: CYTHERURIDAE Müller, 1894  
Subfamily: CYTHERURIDAE Müller, 1894  
Genus: MICROCYTHERURA Müller, 1894

### ? *Microcytherura difficilis* sp. nov.

FIGS 4, 16, 34, 43–51

**Holotype:** AM P26655, adult male.

**Paratypes:** AM P26656–26657, population of males, females and juveniles.

**Type locality:** The Coorong, opposite Mount Mills, S.A.

**Material:** A topotypic population.

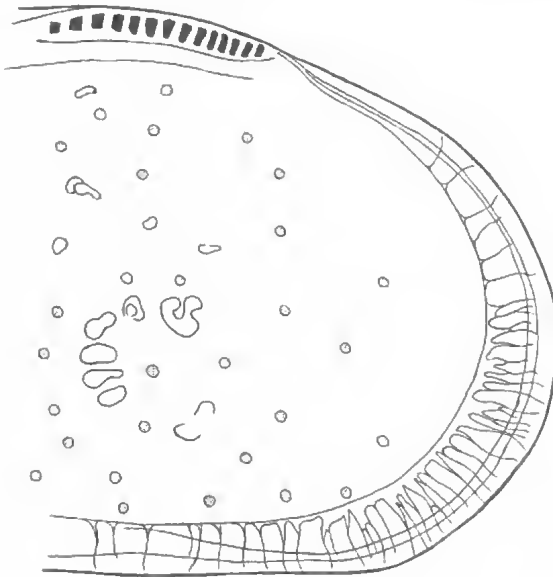
**Description:** Shell whitish, small; subrectangular in lateral view; equivalved; weakly reticulate over entire surface, reticulations forming concentric pattern anteriorly and ventrally; dorsum straight; anterior rounded, trending anteroventrally; posterior rounded; venter weakly inflexed anteromedially; greatest height slightly in front of muscle scars and

about half length. In dorsal view, elliptical; narrowing anteriorly, but more rounded posteriorly; greatest breadth medial, and just over half length. Internally: lamellae moderately broad; anterior vestibule and small posterior vestibule present; marginal pore canals number about 10 anteriorly and 5 ventrally, all short and straight; normal pore canals scattered, sieve type; central muscle scar pattern consisting of subvertical row of 4 adductors, a V-shaped frontal scar and 2 mandibulars; hinge merodont, comprising terminal crenulate teeth in RV with intervening furrow and terminal crenulate sockets in LV with an intervening ridge. Shell sex dimorphism not marked, but females tend to be shorter and relatively broader than males.

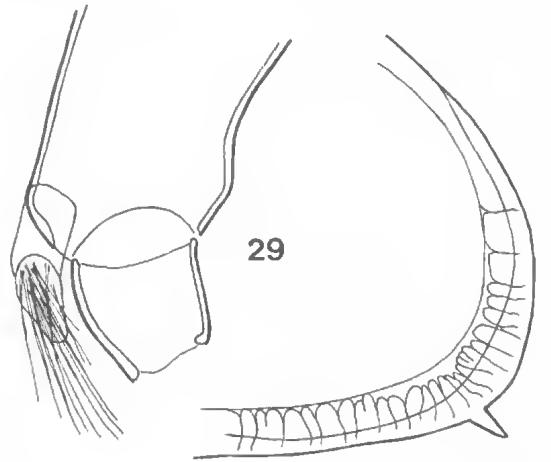
Antennule 6-segmented; segmental length ratios 14:17:5:5:6:8; terminal segment about 4 times as long as wide; armature less powerful than in *Cyprideis* and *Cytheroma*. Antenna 4-segmented; segmental length ratios 13:5:26:3; flagellum extending to about tip of terminal claw and bent distally; terminal claw short and stout. Forelip denticulate distally. Mandible coxa with anterior tooth projecting distinctly forwards of others (typical for this genus); endopod normal, segments relatively wide. Maxillule partially destroyed during dissection, comprising an epipod with about 10 Strahlen and a normal palp and lobes; length ratio of 2 palp segments 13:4. Walking legs (P I to P III) increasing in length from P I to P III. Hemipenis (Fig. 51) comprising a large posterior part and small pointed anterior lappet.

**Dimensions:** Holotype, adult male—L = 0.37 mm; H = 0.21 mm; B = 0.20 mm. Paratype, adult female—L = 0.35 mm; H = 0.20 mm; B = 0.20 mm.

**Discussion:** This species proved to be a taxonomic problem, being like *Microcytherura* in carapace characters except that the posterior cauda, which is weakly expressed in the European species of the genus, appears to be absent or almost absent in this species. But the Australasian genus *Loxocythere* Hornibrook, 1952 is also similar in carapace characters. As far as the soft parts are concerned, this species has the prolonged anterior tooth on the mandible coxa which characterises *Microcytherura*, and the typical antennal flagellum and slender antennule of cytherurines, but the walking legs are less slender than in cytherurines and the hemipenis only vaguely resembles the *Microcytherura* pattern (Sars 1926, description of

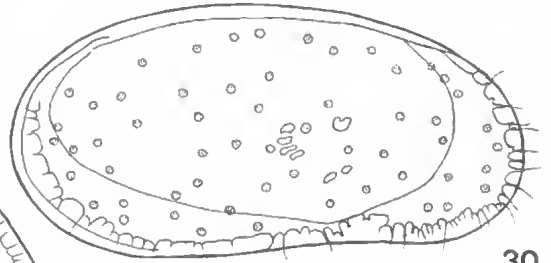


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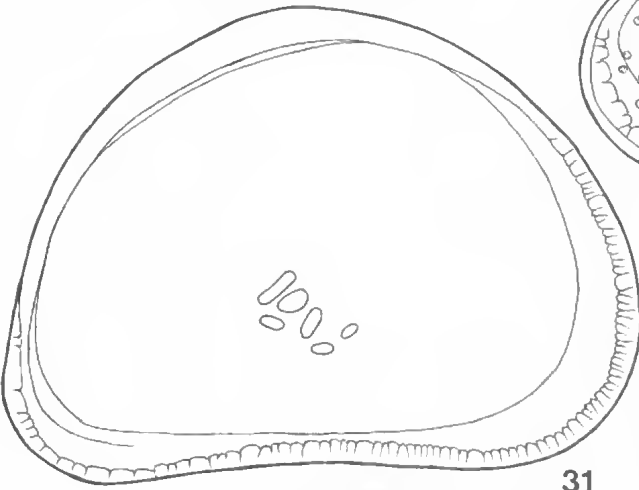


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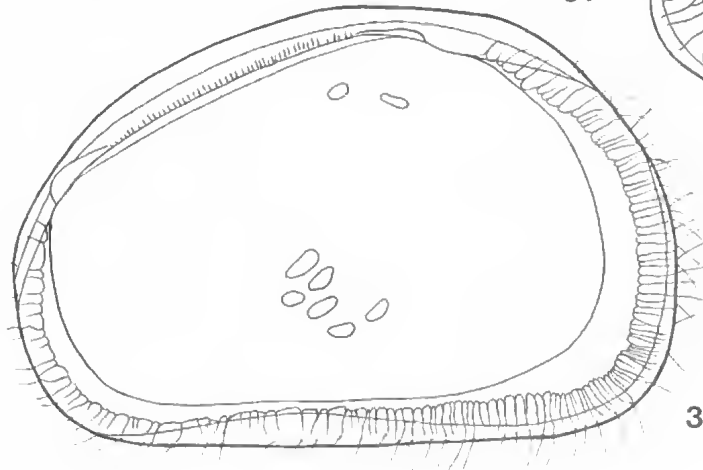
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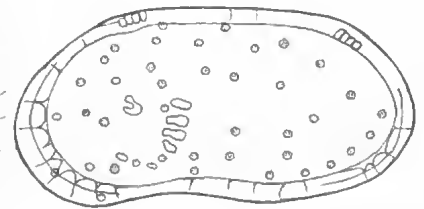
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*M. fulva*). On balance, the difficulties in making a confident generic placement remain.

This taxon is distinct from two previously described Australian species assigned to the genus (McKenzie 1967a) of which one, *M. riebeli*, is confirmed in the genus on soft parts as well (McKenzie, unpublished data).

As a generalisation, most of the difficulties in the taxonomy of such ostracodes stem from their small size and the need to dissect a minute body from the small carapace before examining it further. Often, critical details are destroyed as a result.

*Derivation of name:* From Latin: *difficilis* = difficult.

Family: LIMNOCYTHERIDAE Klie, 1938

Subfamily: LIMNOCYTHERINAE Klie, 1938

Genus: LIMNOCYTHERE Brady, 1868

*Limnocythere mowbrayensis* Chapman, 1914

FIGS 5, 32

*Limnocythere* (sic) *mowbrayensis* Chapman, 1914

*Limnocythere* (sic) *sluida* Chapman, 1919

*Limnocythere* (sic) *perivali* Brehm, 1939

*Limnocythere* (sic) *mowbrayensis*: Hornibrook, 1955

*Locality:* Lake Coolongup, W.A.

Family: CYPRIDIDAE Baird, 1835

Subfamily: MEGALOCYPRIDINAE Rome, 1965

Tribe: MYTILOCYPRIDINI De Deckker, 1975

Genus: MYTILOCYPRIS McKenzie, 1966

*Mytilocypris tasmanica* McKenzie, 1966

*Localities:* Several in W.A., from Lake Walungup to a lake near Lort River (see Appendix II).

*Mytilocypris tasmanica chapmani* subsp. nov.

FIG. 6

*Holotype:* AM P26659, adult male.

*Paratype:* AM P26660, adult female.

*Type locality:* Lake Coolongup, W.A.

*Material:* A topotypic population + 5 individuals from W.A.

*Description:* Shell whitish-yellowish; large; acutely subtriangular (mytiliform) in lateral view; equivalved; smooth; dorsum straight and inclined towards rear; anterior broadly rounded; posterior broadly acuminate; venter weakly inflexed anteromedially; greatest height anteromedial and slightly less than half length. In dorsal view subelliptical, narrowing at both extremities; greatest breadth medial and about 2/5 length. Internally: lamellae broad anteriorly and posteriorly, narrow ventrally; line of concrescence submarginal; inner margin regular; marginal pore canals numerous and straight; normal pore canals scattered, simple, open; central muscle scars a rosette of 4-6 adductors plus 2 mandibulars and small frontal scar; hinge of usual ridge and groove type.

The soft body is like that of *Mytilocypris tasmanica* but the male of *chapmani* differs at least in that it has only about 50 rosettes on the Zenkers Organ (about 60 in *tasmanica*). The hemipenis, however, is not very different. Other well marked differences are in the shell proportions, with *chapmani* being higher with respect to its length than *tasmanica*. In addition, these characters have not been reported previously for the genus but are likely to be constant at the generic level: rake-like organs with 9-10 teeth, one bifid; mandible endopod ventral  $\alpha$  bristle long and slender, ventral  $\beta$  bristle pilose, shorter and stout, distal  $\gamma$  bristle thick and tapering with spiky hairs distally.

*Dimensions:* Holotype, adult male—L = 2.68 mm, H = 1.25 mm, B = 1.10 mm. Paratype, adult female—L = 2.88 mm, H = 1.45 mm, B = 1.33 mm.

*Discussion:* The taxon is described as only a subspecies because although it differs in several carapace and soft part characters, the hemipenis is closely similar to that of the nominate subspecies. It appears to differ sufficiently from other species in the genus described by Chapman (1966) and De Deckker (1978) to sustain a new taxon; in particular because the

Figs 27-34. Figs 27, 28: *Cyprideis westraliensis* n. sp., paratype, AM P26651, female; 27: internal LV anterior, 28: internal RV posterior, with posteroventral spine,  $\times 150$ . Fig. 29, *Cyprinotus edwardi* sp. nov., paratype, AM P26664, female, mandible endopod, detail  $\gamma$  bristle,  $\times 600$ . Fig. 30, *Cytheroma sudaustralis* sp. nov., holotype, male, internal LV,  $\times 150$ . Fig. 31, *Diacypsis paracompacta* sp. nov., paratype, AM P26672, male, internal LV,  $\times 150$ . Fig. 32, *Limnocythere mowbrayensis* Chapman 1914, AM P26658, female, internal RV,  $\times 150$ . Fig. 33, *Reticypris herbsti* gen. nov., sp. nov., paratype, AM P26678, female, internal LV,  $\times 150$ . Fig. 34, ? *Micracytherura difficilis* sp. nov., holotype, male, internal RV,  $\times 150$ .

valve proportions (length:height) are unlike those in the other species. Sympatry with the nominate subspecies does not occur, but since Ostracoda are readily transported by birds and other agencies (McKenzie 1973) it cannot be ruled out as a future possibility, in which case the resulting introgressions should make an interesting study.

*Derivation of name:* For M. A. Chapman who described several large Australian species.

Genus: AUSTRALOCYPRIS De Deckker, 1974

*Australocypris hypersalina* De Deckker, 1974

*Localities:* Eleven localities in S.A. and W.A. (see Appendix II); the commonest species in the collection.

*Australocypris robusta* De Deckker, 1974

*Locality:* Moderately long, shallow lake 45 km N of Kingston, S.A.

Subfamily: PLATYCYPRIDINAE Hartmann & Puri, 1974

Genus: PLATYCYPRIS Herbst, 1957

*Platycypris baueri* Herbst, 1957

*Localities:* Several localities in S.A. and W.A. (see Appendix II).

Subfamily: CYPRINOTINAE Bronstein, 1947

Genus: CYPRINOTUS Brady, 1886

*Cyprinotus edwardi* sp. nov.

FIGS 8-10, 29, 52-57

*Holotype:* AM P26663, adult male.

*Paratypes:* AM P26664, adult female and three adult males.

*Type locality:* Wagin Lake, W.A.

*Material:* Nine topotypic adults.

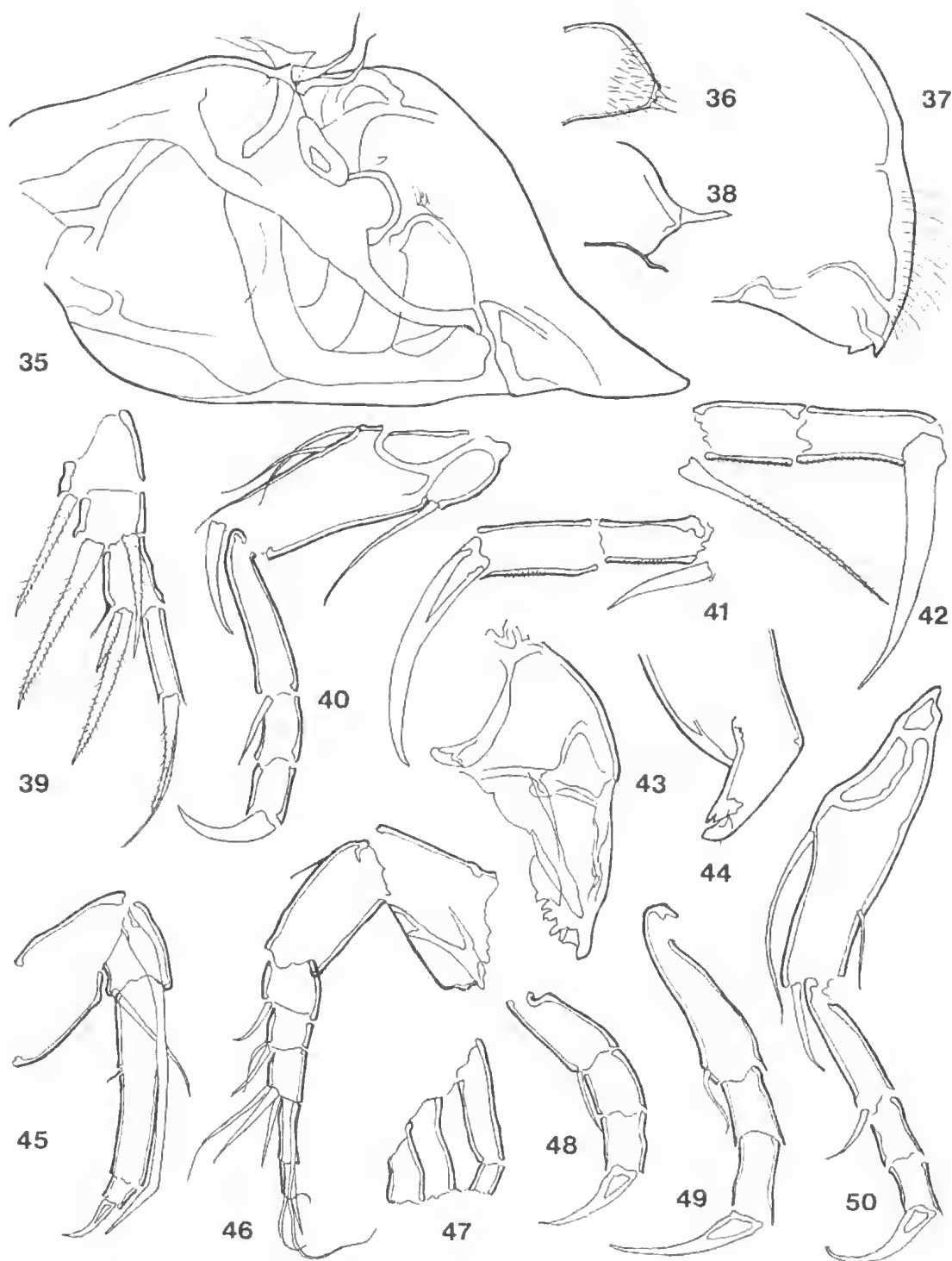
*Description:* Shell yellowish to brownish; large; subtrapezoidal in lateral view; markedly inequivalved, RV overlapping LV by a prominent dorsal hump, LV larger without any dorsal hump but overlapping RV anteriorly and ventrally; shell punctate except in muscle scar region; dorsum straight and inclined posteriorly in LV, hump-like in RV; anterior rounded, pointing anteroventrally; posterior more broadly rounded; venter inflexed medially, ventral margin of RV denticulate anteriorly and posteriorly; greatest height just behind muscle scars and 5/8 of length in RV but about half length in LV. In dorsal view somewhat flexuous; hump turning outwards as does anterior margin; narrowly elliptical with greatest breadth medial and over 1/3 length

(in males). Internally: lamellae rather narrow; line of concrescence marginal; inner margin regular; marginal pore canals short and numerous; selvage very prominent in RV but absent in LV; LV with series of shallow ventral indentations to match RV denticulation; normal pore canals scattered, simple, open; central muscle scars of usual cypridid pattern, comprising 4 adductors and 2 mandibulars; hinge consisting of RV ridge and LV groove. Carapace sex dimorphism: females larger and slightly broader than males.

Antennule 7-segmented; segmental length ratios 64:17:22:13:11:9:9; terminal segment over twice as long as wide; "natatory" setae more than twice as long as 5 distal segments combined. Antennal endopod 3-segmented, length ratios of segments 22:18:1.5; flagellum reaching almost to middle of first endopod segment; "natatory" setae distal on this segment, reaching to tips of terminal claws. Mandible coxa normal; epipod with about 6 Strahlen; endopod  $\alpha$  and  $\beta$  bristles both slender and pilose,  $\gamma$  bristle thick and tapering, adorned near its end with spiky hairs. Maxillule epipod with 3 downwards directed and 20 other Strahlen; second palp segment cylindrical and narrow; third lobe with 2 toothed Zahnborsten. Maxilla (P I) epipod with 6 Strahlen; female palps similar with 3 terminal bristles, 2 subequal, third about twice as long; male palps dissimilar and modified as clasping organs. Walking leg (P II) endopod 4-segmented; segmental length ratios 16:7:8:3; terminal claw about half again as long as last 3 segments combined. Cleaning limb (P III) reflexed, slender, normal. Chitin support with simple distal point; branched proximally, dorsal branch short and sharply curved, ventral branch less curved and relatively long. Furca with 2 claws and 2 bristles; length ratios for furcal shaft:anterior claw:posterior claw 35:20:12; length:width of shaft 15:1; bristles subequal, posterior one separated by definite gap from posterior claw. Zenkers Organ (males) with 30-31 whorls. Hemipenis subtriangular with prominent anterior process and distinctly downturned flap. Cups of nauplius eye fused. *Dimensions:* Holotype, adult male—L = 1.59 mm; H = 1.13 mm; B = 0.63 mm. Paratype, adult female—L = 1.90 mm; H = 1.43 mm; B = 0.85 mm.

*Discussion:* *Cyprinotus* is one of the more distinctive continental ostracode genera, and is easily placed on carapace characters alone by the RV dorsal hump and ventral marginal den-





Figs 35–50. Figs 35–37: *Cytheroma sudaustralis* n. sp., holotype, male. 35: hemipenis; 36: posterior of body; 37: labrum. Figs 38–42: *Cytheroma sudaustralis* n. sp., paratype, AM P26653, female. 38: posterior of body; 39: distal antennule; 40: P I; 41: distal P II; 42: distal P III. Figs 43–50: ? *Microcytherura difficilis* n. sp., holotype, male. 43: labrum; 44: distal mandible; 45: antenna; 46: antennule; 47: maxillule (segments only); 48: distal P I; 49: distal P III; 50: P II. All magnifications x 600.

tifications. This species is more flexuous in dorsal view than other known species, including the two species previously described from Western Australia—*C. dahl* Sars and *C. kimberleyensis* McKenzie. Recently, *C. edwardi* was found in a collection made in December 1976 by W. D. Williams on Kangaroo Island, S.A., so the species has a wide distribution in southern Australian salt lakes.

*Derivation of name:* For D. H. D. Edward, who has made several excellent large collections of Western Australian entomostracans.

**Subfamily: DIACYPIDINAE McKenzie**

*Diagnosis:* A subfamily of cypridid Ostracoda characterised by small-medium sub-triangular or subrectangular smooth or reticulate carapaces and either lacking epipods on the P I altogether or having epipods with only 2 Strahlen. Confined to Australia.

Although first noted as distinctive by McKenzie (1977b) the above constitutes its formal designation.

*Discussion:* The endemic Australian genus *Diacypis* has been regularly referred to the Eucypridinae Bronstein, 1947 (Danielopol and McKenzie 1977). But unlike the eucypridine genera, which are relatively large and typically mytiliform in lateral view, *Diacypis* is smaller and more regularly subtriangular in lateral view; also, whereas all eucypridines have well developed epipods with 6 Strahlen on the P I, the diacypridine genera either lack an epipod altogether, or have one with 2 Strahlen. McKenzie (1971) suggested that the presence or absence of a P I epipod alone is insufficient to separate genera which otherwise are very similar. In this instance, however, the character is only one of several by means of which eucypridines and diacypridines can be easily distinguished, as indicated above and as will appear from the descriptions below. Originally the group was proposed as a new tribe, but its status is now raised to subfamily following the rationale of Hartmann & Puri (1974) in their recent general classification of Ostracoda.

McKenzie (1977b) noted that diacypridines occupy in Australia the niches filled in South Africa by cypridopsines. This is an instance of habitat convergence, since taxonomically the groups are very distinct.

**Genus: DIACYPRIS Herbst, 1961**

***Diacypis dietzi* (Herbst, 1958)**

*Localities:* Several in S.A. (see Appendix II). This is the most common *Diacypis* in the collection.

***Diacypis fodiens* (Herbst, 1958)**

*Localities:* Several localities in S.A. (see Appendix II).

***Diacypis whitei* (Herbst, 1958)**

*Localities:* Several localities in S.A. (see Appendix II).

***Diacypis paracompacta* sp. nov.**

FIGS 11, 12, 31, 58–62

*Holotype:* AM P26669, adult male.

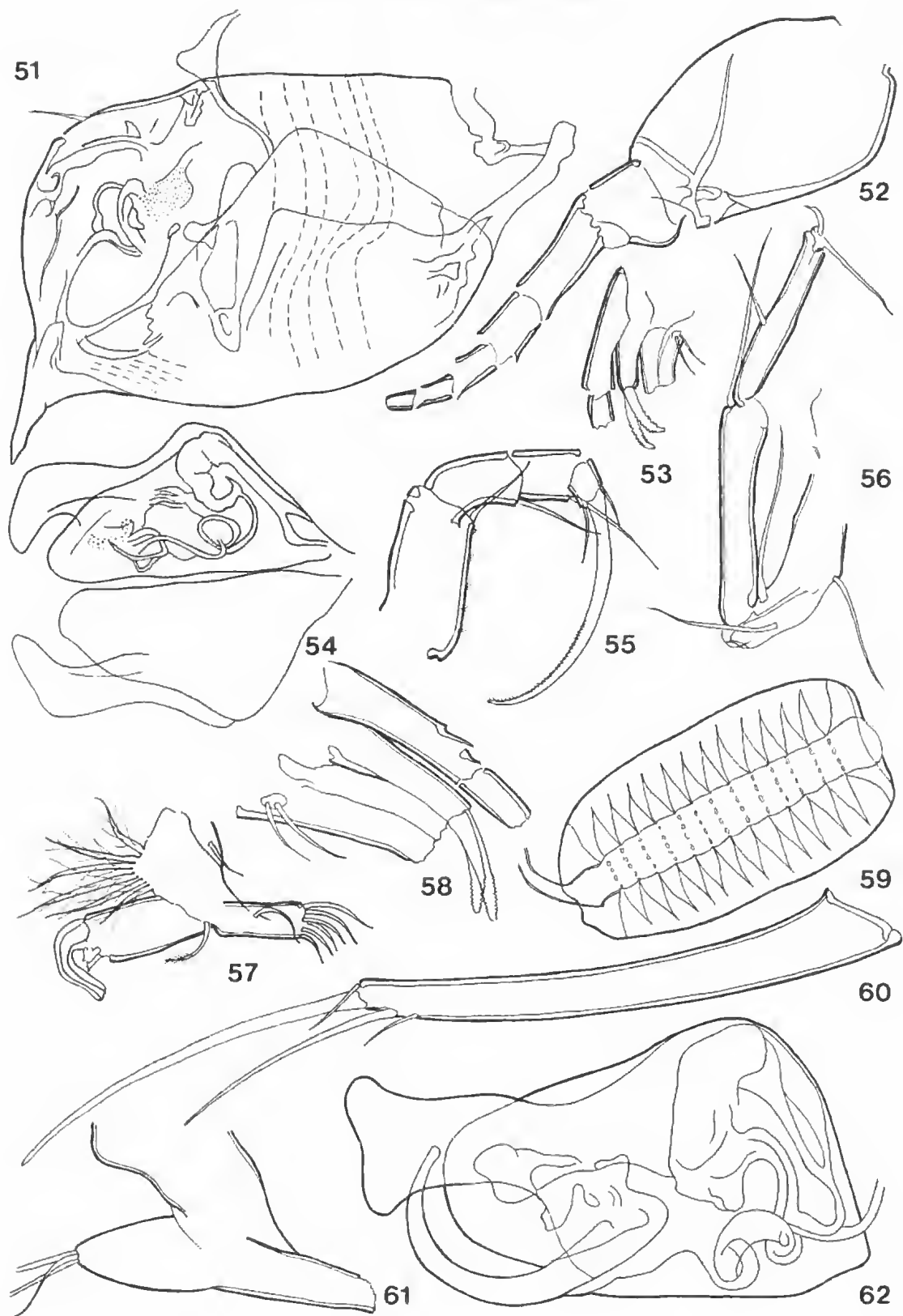
*Paratypes:* AM P26670–26672, 3 adult females, 1 adult male.

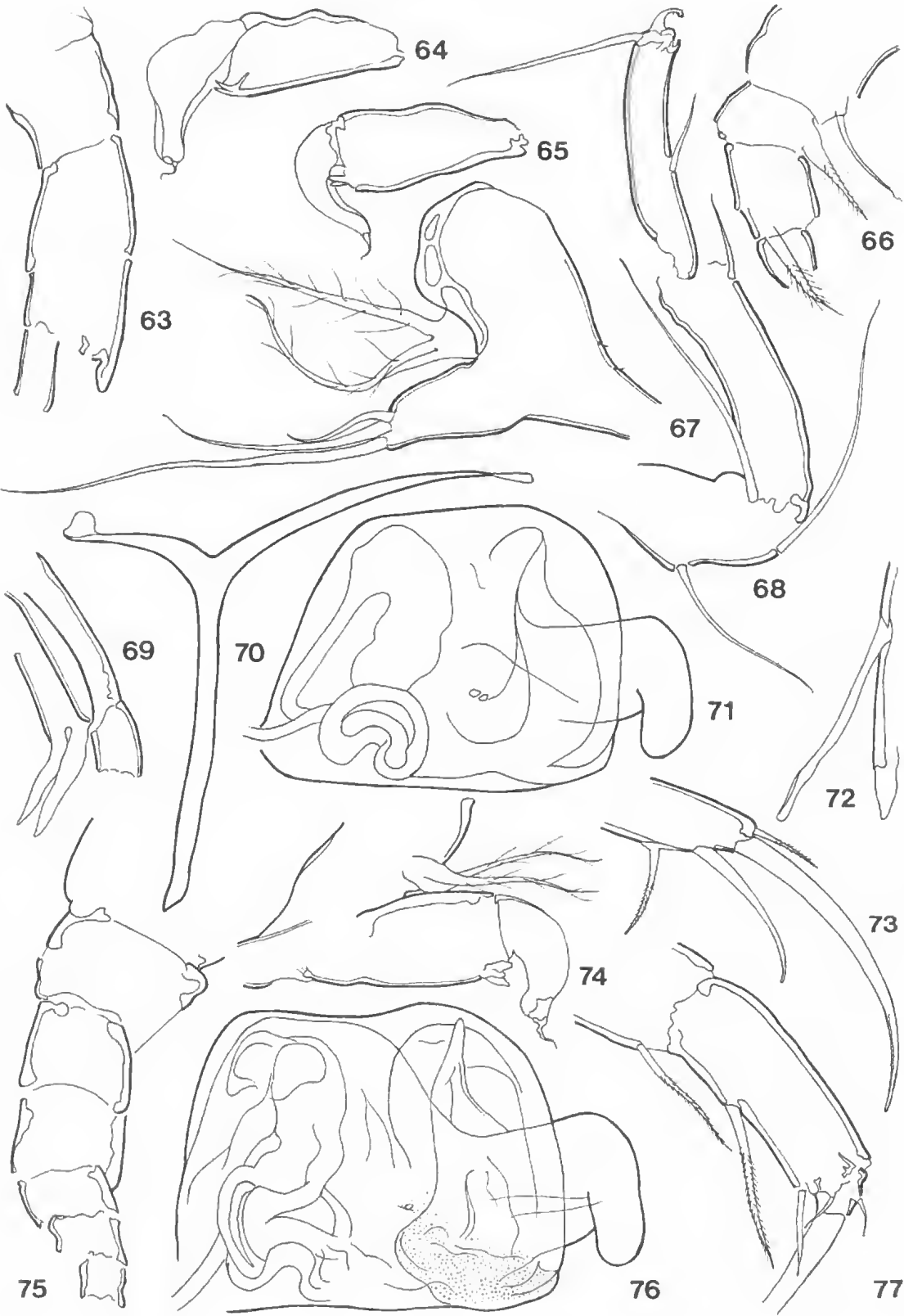
*Type locality:* Very large shallow lake 15 km N of Kingston, S.A.

*Material:* A topotypic population and individuals from a small salt lake about 16 km N of Meningie and two samples from the cut-off portion near "Cantara", The Coorong.

*Description:* Shell whitish; small-medium sized; regularly subtriangular in lateral view; LV larger than RV, and overlapping it dorsally by a low elongate ridge; micropunctate; dorsum strongly convex, more so in LV; anterior broadly rounded; posterior more narrowly rounded, trending posteroventrally; venter inflexed medially; greatest height medial, about 2/3 length. In dorsal view subelliptical, narrowing anteriorly, more rounded posteriorly; greatest breadth medial and just under half length. Internally: lamellae broad; line of concrescence submarginal; inner margin regular; marginal pore canals numerous short and straight anteriorly and posteriorly, longer ven-

Figs 51–62. Fig. 51: ? *Microcytherura difficilis* sp. nov., holotype, male, hemipenis,  $\times 600$ . Figs 52–57: *Cyprinotus edwardi* sp. nov., holotype, male. 52: antennule (segments only),  $\times 150$ ; 53: maxillule palp and lobes (segments only) with Zahnborsten,  $\times 150$ ; 54: hemipenes,  $\times 62.5$ ; 55: P II,  $\times 150$ ; 56: P III,  $\times 150$ ; 57: P I,  $\times 150$ . Fig. 58: *Diacypis paracompacta* sp. nov., paratype, AM P26670, female, maxillule palp and lobes (segments only) with Zahnborsten,  $\times 600$ ; Figs 59, 60: *Diacypis paracompacta* sp. nov., holotype, male. 59: Zenkers Organ,  $\times 600$ ; 60: furca,  $\times 600$ . Fig. 61: *Diacypis paracompacta* sp. nov., paratype, AM P26670, female, P I (without setation), note absence of epipod,  $\times 600$ . Fig. 62: *Diacypis paracompacta* sp. nov., paratype, AM P26672, male, hemipenis,  $\times 600$ .





trally; normal pore canals scattered, simple, open; muscle scar field posteromedial, comprising rosette of 4 adductors plus 2 mandibulars; hinge consisting of RV ridge and LV groove. Shell sex dimorphism weak, females usually larger and with greater size range than males.

Antennule 7-segmented; segmental length ratios 70:20:20:18:15:8:8; "natatory" setae about four times as long as 5 distal segments combined. Antennal endopod 3-segmented; length ratios of segments 23:14:4; "natatory" setae extending beyond terminal claws and originating mediodistally on first endopod segment; flagellum reaching distal end of this segment. Mandible coxa normal; epipod with about 6 Strahlen; endopod normal,  $\alpha$  and  $\beta$  ventral bristles slender and pilose,  $\gamma$  bristle thick and tapering, about twice as long as terminal segment. Maxillule epipod with about 20 Strahlen; palp cylindrical, narrow; length ratio of palp segments 20:9; third lobe with 2 weakly toothed Zahnborsten; 2 short bristles proximally on first lobe. Maxilla (P I) epipod absent; endopod in female with 3 terminal bristles, one short, second about twice as long and third very long; in males, endopods modified as asymmetric clasping palps, right broader and less flexuous than left. Walking leg (P II) endopod 3-segmented (penultimate segment undivided); segmental length ratios 16:18:3; terminal claw about as long as endopod segments combined. Cleaning limb (P III) reflexed, normal. Chitin supports with simple point distally; branched proximally, with dorsal branch about 2/3 length of ventral branch. Furcal shaft gently curved, with normal complement of claws and bristles; shaft:anterior claw:posterior claw length ratios 40:30:13; shaft length:width about 20:1; bristles subequally long, posterior bristle slightly displaced from posterior claw. In males, Zenkers Organ has 12-13 whorls. Hemipenis with relatively straight weakly bilobate anterior process; basal process well chitinised and strongly curved. Rake-like organs each with 8 teeth, one bifid. Cups of nauplius eye fused.

*Dimensions:* Holotype, adult male—L = 0.55 mm; H = 0.40 mm; B = 0.25 mm. Paratype, adult female—L = 0.58 mm; H = 0.41 mm; B = 0.28 mm.

*Discussion:* The posteromedial muscle scar field and the relatively shortened antennule segments are further characters which separate diacypridines from eucypridines. Male characters, such as the number of whorls in the Zenkers Organ and the hemipenis morphology, are also distinct and unlike such features in eucypridines.

The new species is very close to *D. compacta* (Herbst, 1958) but in that species there is no dorsal overlap by the LV of the RV, such as characterises *paracompacta*. This feature also separates *D. paracompacta* from the following species.

*Derivation of name:* From the Latin para = similar, and the species name compacta.

#### *Diacypris occidentalis* sp. nov.

FIGS 7, 13, 14, 20

*Holotype:* AM P26673, adult male.

*Paratypes:* AM P26674, 2 adult females, 1 adult male.

*Type locality:* Lake Dumbleyung, W.A.

*Material:* Topotypic material and populations from Lake Chidrup, Lake Stubbs, and Newdigate, a shallow salt water lake near Lake Grace, all in W.A.

*Description:* Shell greenish in life; small-medium sized; regularly subtriangular in lateral view; almost equivalved; smooth; dorsum strongly convex; anterior broadly rounded; posterior more narrowly rounded, trending posteroventrally; venter inflexed medially; greatest height medial and over 2/3 length. In dorsal view subelliptical; narrowing anteriorly and rounded posteriorly; greatest breadth medial and about half length. Internally: similar to *D. paracompacta*. Sex dimorphism weak, females usually larger than males.

The soft parts are closely similar to those of *D. paracompacta* except for these differences:

Figs 63-77. Figs 63-65, *Reticypris herbsti* n. gen., n. sp., holotype, male. 63: antenna endopod (segments only); 64: P I, right palp; 65: P I, left palp; Figs 66-69: *Reticypris herbsti* n. gen., n. sp., paratype, AM P26678, female. 66: mandible endopod (segments only) with  $\alpha$ ,  $\beta$ , and  $\gamma$  bristles; 67: P I; 68: P III; 69: maxillule palp and third lobe with Zahnborsten. Figs 70, 71: *Reticypris* n. gen., n. sp., holotype, male. 70: chitin support; 71: hemipenis. Figs 72-77: *Reticypris dedeckkeri* n. gen., n. sp., holotype, male. 72: detail antennal sensory seta; 73: distal furca; 74: right P I; 75: antennule (segments only); 76: hemipenis; 77: distal P II. All magnifications  $\times 600$ .



The length ratios furcal shaft: anterior claw: posterior claw in *D. occidentalis* are 44:29:13, i.e. the shaft is slightly longer than in *D. paracompacta*. Further, the basal process of the hemipenis in *D. occidentalis* is thicker than in *D. paracompacta*, and of similar thickness throughout its length, not tapering as in *D. paracompacta*; also, the anterior process does not extend as far beyond the basal process as in the South Australian species. The Zenkers Organ has 11-12 whorls.

**Dimensions:** Holotype, adult male—L = 0.56 mm; H = 0.38 mm; B = 0.25 mm. Paratype, adult female—L = 0.60 mm; H = 0.43 mm; B = 0.28 mm.

**Discussion:** *D. occidentalis*, like *D. compacta* (Herbst, 1958) does not have the same definite LV overlap which characterises *D. paracompacta*. It is a distinctly smaller species than *D. compacta* which has a length of about 0.71 mm and 14 whorls on the Zenkers Organ. Nevertheless, the three species must be considered a closely allied group since their hemipenes are so alike.

**Derivation of name:** From the Latin, *occidentalis* = western, a reference to the species' Western Australian provenance.

#### ? *Diacypri* sp.

**Localities:** Two localities in W.A. (see Appendix II) but the taxon is known to occur also in South Australia (De Deckker pers. comm.).

**Discussion:** The shell of this species is characterised by a pronounced overlapping hump in the LV; and by the presence of several strong spines on the carapace, one or two anteriorly and one posteroventrally on each valve. It is unlike any previously described *Diacypri* in shell characters, and there were no soft parts in the specimens encountered in this collection. De Deckker (pers. comm.) has indicated that the soft anatomy is like *Diacypri*. Of the three specimens available, the largest measured 0.70 mm.

#### *Reticypri* gen. nov.

**Type species:** *Reticypri herbsti* sp. nov.

**Diagnosis:** *Diacypri* genus characterised by small-medium size; reticulate carapace; maxilla (P 1) epipod with 2 Strahlen; rectangular hemipenis with downturned flap on anterior process; relatively smooth Zahnborsten on third lobe of maxillule. Otherwise, like *Diacypri* in its soft anatomy.

**Discussion:** It is apparent that *Reticypri*, especially in its reticulate carapace, is very dif-

ferent from *Diacypri*. However, there are some points of strong resemblance even in the carapace, notably the posteromedial muscle scar field. The differences are probably enough to justify a new tribal category for *Reticypri*. But with only one genus known with certainty for each tribe such a move seems premature, although consistent with modern taxonomic practice in which even subfamilies have been named for single ostracode genera.

**Derivation of name:** From the Latin, *rete* = a net and the generic suffix *cypri*; for the reticulate carapace. The genus is feminine.

#### *Reticypri herbsti* sp. nov.

FIGS 15, 17, 33, 63-71

**Holotype:** AM P26676, adult male.

**Paratypes:** AM P26677-P26679, 3 adult females.

**Type locality:** Very large shallow lake 15 km N of Kingston, S.A.

**Description:** Shell whitish-brownish, small-medium sized; subquadrate in lateral view; inequivalved, LV larger and overlapping dorsally; reticulate and with weak ventral ridge which is more noticeable in RV; dorsum gently convex, inclined towards rear; anterior broadly rounded; inflexed anterodorsally in RV where LV overlaps it; posterior more narrowly rounded; venter inflexed medially; greatest height anteromedial (LV) and about 2/3 length. In dorsal view subelliptical; narrowing anteriorly, more rounded posteriorly; greatest breadth medial and about half length. Internally; lamellae broad; line of concrescence submarginal; inner margin regular; weak selvage present in LV; marginal pore canals numerous and straight; normal pore canals scattered, simple, open; muscle scar field posteromedial, comprising rosette of 4 adductors plus 2 mandibulars; hinge consisting of narrow RV ridge with small triangular anterior projection (antislip element) and accommodation groove in LV. Shell sex dimorphism not marked, females usually larger than males.

Antennule 7-segmented; segmental length ratios 93:25:23:22:13:15:12; "natatory" setae about 4 times as long as 5 distal segments combined. Antennal endopod 3-segmented; segmental length ratios 22:13:15; flagellum extending beyond distal end of first endopod segment; "natatory" setae extending well beyond tips of terminal antennal claws and originating mediolaterally on first endopod segment. Mandible coxa normal; epipod with 6

Strahlen plus basal seta. Maxillule normal; epipod with about 20 Strahlen; length ratio of pulp segments 5:2; Zahnbörsten of third lobe relatively smooth. Maxilla (P I) normal; epipod small but distinct, bearing 2 Strahlen; male palps asymmetric as in *Diacypris*. Walking leg (P II) with the penultimate segment undivided; terminal claw powerful, curved and about twice as long as penultimate segment. Cleaning limb (P III) normal; terminal segment small but distinct. Furcal shaft evenly curved, length ratios of shaft:anterior claw:posterior claw 45:21:12; bristles about equal, posterior one separated from posterior claw by small gap. Chitin support with bluntly pointed distal tip and forked proximally, ventral branch almost twice as long as dorsal branch. In males, Zenkers Organ has 10–11 whorls; hemipenis is rectangular, anterior process with a downturned flap. Cups of nauplius eye fused. Posterior of body without any prominent lobe.

**Dimensions:** Holotype, adult male—L = 0.54 mm; H = 0.38 mm; B = 0.25 mm. Paratype, adult female—L = 0.58 mm; H = 0.40 mm; B = 0.28 mm.

**Derivation of name:** For H. V. Herbst, who described *Diacypris*.

***Reticypriis dedeckkeri* sp. nov.**

FIGS 18, 19, 72–77

**Holotype:** AM P26680, adult male.

**Paratypes:** AM P26681–26682, 3 adult females, 1 adult male.

**Type locality:** Small pond south of Yorketown, S.A.

**Description:** Shell whitish-brownish; medium sized; subreniform in lateral view; inequivalved, but not as markedly so as *R. herbsti*; reticulate, without ventral ridge; dorsum gently convex but not so inclined towards rear as in *R. herbsti*; anterior and posterior about equally broadly rounded in LV, anterior more broadly rounded in RV; venter inflexed medially; greatest height anteromedial and about 3/5 length. In dorsal view; with subparallel flanks; more narrowed anteriorly than posteriorly; greatest breadth medial in males, slightly posteromedial in females and about half length. Internally; similar to *R. herbsti*. Shell sex dimorphism not marked, females usually larger and slightly broader than males.

The soft part morphology is very similar to that of *R. herbsti*, except that the length ratios of furcal shaft:anterior claw:posterior claw are 50:23:12, i.e. the shaft is slightly longer in *R. dedeckkeri*. In males, the Zenkers Organ has 10 whorls in *R. dedeckkeri* and the hemipenis differences can be checked on the illustrations (figs 71, 76).

**Dimensions:** Holotype, adult male—L = 0.68 mm; H = 0.40 mm; B = 0.31 mm. Paratype, adult female—L = 0.68 mm; H = 0.41 mm; B = 0.34 mm.

**Discussion:** The two species of *Reticypriis* described above can be readily distinguished on shell characters alone. Of the two, *R. dedeckkeri* is much the larger, has a subreniform, rather than subquadrate, shape in lateral view and no ventral ridge and differs also in dorsal view.

At present *R. dedeckkeri* is known only from the type locality.

**Derivation of name:** For P. De Deckker, who has recently described two new Australian ostracode genera.

**Other species**

Several other species are present in the material (Appendix II). But they are listed in open nomenclature and, except in the case of ? *Diacypris* sp. which is very distinctive, no further details on them are included. Usually, there are not enough specimens to base a description upon. In other cases, the available specimens are either juvenile or occur as fragments only. One specimen in sample S.A. 40, a *Diacypris* sp. with spinose ventral margins and measuring 0.88 mm, was destroyed during scanning electron microscopy of the fauna.

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